



Standard Test Method for Examination of Seamless, Gas-Filled, Pressure Vessels Using Acoustic Emission¹

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1. Scope

1.1 This test method provides guidelines for acoustic emission (AE) examinations of seamless pressure vessels (tubes) of the type used for distribution or storage of industrial gases.

1.2 This test method requires pressurization to a level greater than normal use. Pressurization medium may be gas or liquid.

1.3 This test method does not apply to vessels in cryogenic service.

1.4 The AE measurements are used to detect and locate emission sources. Other nondestructive test (NDT) methods must be used to evaluate the significance of AE sources. Procedures for other NDT techniques are beyond the scope of this test method. See Note 1.

NOTE 1—Shear wave, angle beam ultrasonic inspection is commonly used to establish circumferential position and dimensions of flaws that produce AE.

1.5 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific precautionary statements are given in Section 7.

2. Referenced Documents

2.1 ASTM Standards:

- A 388/A 388M Practice for Ultrasonic Examination of Heavy Steel Forgings²
- E 543 Practice for Evaluating Agencies that Perform Nondestructive Testing³
- E 650 Guide for Mounting Piezoelectric Acoustic Emission Sensors³
- E 976 Guide for Determining the Reproducibility of Acoustic Emission Sensor Response³

¹ This test method is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.04 on Acoustic Emission Method.

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² Annual Book of ASTM Standards, Vol 01.05.

³ Annual Book of ASTM Standards, Vol 03.03.

E 1316 Terminology for Nondestructive Examinations³

2.2 ASNT Standards:⁴

SNT-TC-1A Recommended Practice for Nondestructive Testing Personnel Qualification and Certification
ANSI/ASNT CP-189 Standard for Qualification and Certification of Nondestructive Testing Personnel

2.3 Code of Federal Regulations:

Section 49, Code of Federal Regulations, Hazardous Materials Regulations of the Department of Transportation, Paragraphs 173.34, 173.301, 178.36, 178.37, and 178.45⁵

2.5 Compressed Gas Association Standard:

Pamphlet C-5 Service Life, Seamless High Pressure Cylinders⁶

3. Terminology

3.1 *Definitions*—See Terminology E 1316 for general terminology applicable to this test method.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *fracture critical flaw*—a flaw that is large enough to exhibit unstable growth at service conditions.

3.2.2 *marked service pressure*—pressure for which a vessel is rated. Normally this value is stamped on the vessel.

3.2.3 *normal fill pressure*—level to which a vessel is pressurized. This may be greater, or may be less, than *marked service pressure*.

4. Summary of Test Method

4.1 The AE sensors are mounted on a vessel, and emission is monitored while the vessel is pressurized above normal fill pressure.

4.2 Sensors are mounted at each end of the vessel and are connected to an acoustic emission signal processor. The signal processor uses measured times of arrival of emission bursts to determine linear location of emission sources. If measured emission exceeds a prescribed level (that is, specific locations produce enough events), then such locations receive secondary (for example, ultrasonic) examination.

4.3 Secondary examination establishes presence of flaws

⁴ Available from American Society for Nondestructive Testing, 1711 Arlinggate Plaza, P.O. Box 28518, Columbus, OH 43228-0518.

⁵ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

⁶ Available from Compressed Gas Association, Inc., 1235 Jefferson Davis Highway, Arlington, VA 22202.